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The surgical outcome of percutaneous nephrolithotomy based on principle of right triangle for renal access with fix C-arm and no the contrast

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ABSTRACT

Objective: Evaluation of result of the puncture technique into the renal calyces based on principle of right triangle in PCNL with fix C-arm and no the contrast.

Materials and Methods: 102 cases of percutaneous nephrolithotomies have been performed at Department of Urology of Hue Central Hospital from Jan 2015 to Apr 2017 with no the contrast.

Results: Mean age of patients was 47.2 ± 10.7 years (23 - 69). Renal pelvis stones in 14 cases (13.73%), renal calyx stones in 15 cases (14.70%), staghorn stones in 29 cases (28.43%) and renal pelvis-calyx stones in 44 cases (43.14%). Hydronephrosis of grade I: 33 cases (32.35%), grade II: 36 cases (35.30%), grade III: 9 cases (8.82%), no hydronephosis: 24 cases (23.53%). Percutaneous renal access into inferior posterior of the kidney in 47 cases (46.08%), middle calyx 42 cases (41.17%) and superior calyx 13 cases (12.75%). Average time of puncture: 8 ± 18 seconds (fastest 3 seconds and slowest 67 seconds). Successful punture into calyx was 100%. No accidents in the technique.

Conclusions: The puncture technique into the renal calyces based on principle of right triangle in PCNL is a good, fast, exact and safe technique.

Introduction

Recent advances in both technology and equipment have rendered percutaneous nephrolithotomy (PCNL) the most appropriate surgical choice for renal stone treatment [1]. Such surgery is safe when treating large renal stones [2]. One of the most important steps of PCNL is gaining access to the renal collecting system before dilatation [3]. This step is frequently associated with complications [4]. How make the needle access into the collecting system to avoid the complications and can be clearly the stone, that is require the good choice of the position in the collecting system and the exact renal access. With these results, a lot of authors had reported many methods to renal access. However, the advantages and disadvantages is still exist. Especially, the time for many reports is longer. We want to present the method with fix the C-arm and no use the contrast in PCNL with the very short time for the renal access.

Patients and Methods

The records of patients with renal stones larger than 2 cm in diameter who underwent PCNL in Hue Central Hospital between January 2015 and April 2018 were retrieved with the method of fix the C-arm and not use the contrast in the renal access. Patients who were multiple access or renal abnormality were excluded. This study was approval by Hospital Research and Ethical Committee.

All PCNL surgeries were performed by experienced endourologists. All PCNL surgeries were performed under general anaesthesia. An open-ended urethral catheter was placed and advanced to the renal pelvis or the upper ureter with the patient in the supine lithotomy position. After placing the catheter, the patient was placed in the prone position and the kidney accessed using an 18-gauge metal needle under C-arm fluoroscopic guidance. A guide wire was inserted into the collecting system via the lumen of the needle.

All patients had had the CT-scan. We were choiced the position (in the collecting system), this position had called A point. We continue choiced the B point on the back (figure 1) and measure the AB by the ruler on the CT-scan. After that, choice the C point, how CB and pelvis are straight (figure 2). Then we measure the CB on the real patient skin. Based on the Pythagore principle in the right triangle, we calculated the length of CA and the degree of ACB corner (figure 3).

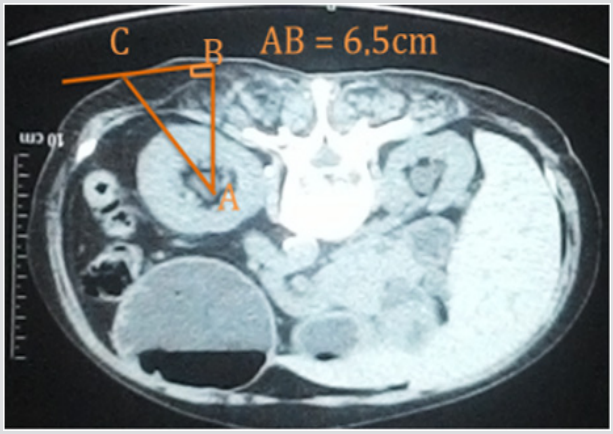

Figure 1: The "triangulation" technique (TT).

All patients received antibiotic prophylaxis during induction phase of the operation using first generation intravenous cephalosporin or a quinolone. Stone-free status was defined as the absence of any residual stone as detected on plain urinary system graphy performed on the first postoperative day or CT realized at the 3rd postoperative month. Data were evaluated with IBM SPSS software (ver. 22.0; IBM SPSS, Armonk, NY, USA).

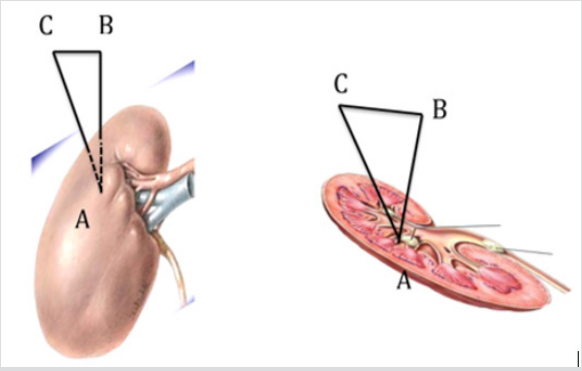

Figure 2: The "triangulation" technique (TT).

Results

We retrieved the medical records of 102 patients. The mean age of all patients was 46.1 ± 11.8 years (range 23 – 69); 61 (59.8%) patients were male. 77/102 (74.51%) cases were undergone previous renal surgery. Mean stone diameter was estimated as 71.2 ± 45.8 (22 – 174) mm (table 1). Mean the renal puncture time as 8 ± 18 (3- 67) seconds. Mean (range) fluoroscopy, and operative times were estimated as 12 ± 26 (5-120) seconds and 67.5 ± 20.5 minutes. Complication rate was calculated as 1.96 percent (bleeding, fever, infection). At the end of the operation JJ catheters were used in all patients. The surgical outcomes and complication were showed in table 2.

Table 1: General characteristics of the patients.

Variables	Value
age (year)	46.1 ± 11.8 (23-69)
Gender	
Male	61 (59.8%)
Female	41 (40.2%)
Stone diameter (mm)	71.2 ± 45.8 (22-174)
Stone features	
Renal pelvis	14 (13.73%)
Renal calyx	15 (14.70%)
Staghorn stone	29 (28.43%)
Renal pelvis and calyx	44 (43.14%)
Renal pelvis dilatation by ultrasound	
Grade III	9 (8.82%)
Grade II	36 (35.3%)
Grade I	33 (32.35%)
Normal	24 (23/53%)
Access location	
Upper pole	13 (12.74%)
Midpolar	42 (41.1 8%)
Lower pole	47 (46.08%)

Table 2: Surgical outcomes.

Variables	Value
Non-enhanced CT	102 (100%)
Operative time (minutes)	67.5 ± 20.5
Fluoroscopic time (seconds)	12 ± 26 (5-120)
Renal puncture time (seconds)	8 ± 18 (3- 67)
Stone free rate	90 (88.24%)
Complications	3 (2.9%)
Hospital stay time (days)	3.2 ± 2.9

Discussion

In this report, we noticed that the time to puncture into the renal is very short if we had measured and calculated before to made the technique and fix the C-arm. Our result is 8 ± 18 (3- 67) seconds and Mohamed is >500 seconds. This short time is helping everything shorter time, especially the fluoroscopic time is 12 ± 26 (5-120) seconds and the operative time is 67.5 ± 20.5 minutes.

Currently, PCNL is considered the gold standard treatment for renal stones that are larger than 2 cm due to the high success rate and relative minimal morbidity. However, in developing countries the incidence of open stone surgery is still high [5].

Abdallah et al compared the TT and EN techniques using a biological model [6]. The mean fluoroscopic time was shorter when the EN technique was employed, but the techniques did not differ significantly in terms of either the number of punctures required or the total operative time [7]. Tepeler et al found that PCNL could be safely performed using either access technique, but the TT was associated with less blood loss because the access tract was better aligned with the infundibulum, reducing the need for high-level torque [8]. In the present study, there was a difference of opinion between the two endourologists in terms of the preferred route for renal access. The first preferred TT, which is based on the idea that bleeding is decreased because less power is applied, as reported by Tepeler et al [8]. The second preferred the application of EN using two axes, which is based on the idea that the targeted infundibulum is accessed without deviation, which provides the shortest distance between the skin and the infundibulum. However, we found no significant difference in terms of either fluoroscopic time or the change in the Hgb level between the two techniques.

Similarly, In their study of 40 patients, who were subject to either EN or TT technique, Tepeler et al found no significant difference in operative time [8]. Abdallah et al reported that both techniques were associated with similar learning curves, and that the TT was associated with a longer fluoroscopic screening time [6].

Operative time is an important factor that can affect the PCNL procedure. In the clinical research office of the endourologicalal society study with nearly 6000 patients from multiple centers, they classify operative duration to short (<50 min), medium (51–75 min), long (76–115 min), and very long (>116 min) [9]. Long operative time increases the duration of anesthesia and may risk postoperative pulmonary complications [10]. Also it increases blood loss, the need for transfusion and overall complication rates [11]. In addition, short operative time is important because it is cost effective.

In our study, the mean operative time was in the short-time group. There are many preoperative factors that might lead to this result (stone burden, stone location, and previous maneuvers). It had been found that several factors affect the operative time with different results among different studies, for example, history of open surgery, the presence of hydronephrosis, stone type, stone burden, surgical experience, BMI, type of imaging for access and calyx for access significantly affect the operative time [12].

Since staghorn stones can not be eliminated completely, they have higher recurrence rates [13]. Increased number or dimensions of stones bring with them more frequent interventions, higher number of complications, and lower stone-free rates. In a study by Akman et al [14]. PCNL was performed on 272 renal units because of the presence of staghorn kidney stone, and median stone-free rate at a single session was reported as 76.5%. More than one accesses were made into 102 (37.5%) units, while only a single access was made for 170 (62.5%) units. El Nahas et al [15] (n=241) and Desai et al [16] (1466) reported that they had achieved significant success rates (56.6, and 56.9%. respectively) at their first attempts in their PCNL procedures performed to relieve kidney staghorn stones. However in our study, initial averae stone-free rate was estimated as 88.24%.

Several complications developed during renal entry and dilatation. Tepeler et al found that the complication rate was somewhat higher in the EN group, but the difference was not statistically significant [8]. In our study, complications were occured in 3 cases with bleeding and infection. All of them were well managed with embolization and antibiotic using and finally discharged in several days. In a study by Akman et al [14] a total of 77 complications were observed in 64 patients. The most frequently seen complication was bleeding, and angioembolization was performed in 2 out of 47 patients because of development of pseudoaneurysm, and arteriovenous fistula. In their series of 119 patients. Netto et al [17] observed complications in 28.5% of their patients including blood transfusion requiring bleeding (n=25), pneumothorax-hydrothorax (n=2), sepsis-bacteremia (n=2), ileus (n=2), and prolonged urine leakage (n=2). In our study, we detected Clavien 1 (fever) (n=2), and Clavien 2 (blood transfusion requiring bleeding) (n=3) complications in respective number of patients. Overall complication ± as detected as 16.6%.

The fact that our study was included only a small number of patients is the principal limitations of the work. Also, we did not compare to other surgical methods (no control), for example, “eye of the needle” technique to renal access.

Conclusion

In summary, the puncture technique into the renal calyces based on principle of right triangle with fix C-arm and no the contrast in PCNL is a good method with fast, exact and safe technique.

References

1. Ghani KR, Sammon JD, Bhojani N, Karakiewicz PI, Sun M, et al. (2013) Trends in percutaneous nephrolithotomy use and outcomes in the United States. J Urol 190(2): 558-564.
2. Barnaba D, Grossi FS, Raguso M, Larocca L, Sallustio G, et al. (2009) Percutaneous treatment of staghorn stones: a retrospective case-control study with evaluation of single vs multiple access to the kidney. Arch Ital Urol Androl 81(1): 40-42.
3. Noureldin YA, Elkoushy MA, Andonian S (2015) Assessment of percutaneous renal access skills during Urology Objective Structured Clinical Examinations (OSCE). Can Urol Assoc J 9(3-4): E104-E108.
4. Ganpule AP, Shah DH, Desai MR (2014) Postpercutaneous nephrolithotomy bleeding: aetiology and management. Curr Opin Urol 24(2): 189-194.
5. Frattini A, Barbieri A, Salsi P, Sebastio N, Ferretti S, et al. (2001) One shot: a novel method to dilate the nephrostomy access for percutaneous lithotripsy. J Endourol 15(9): 919-923.

6. Lopes T, Sangam K, Alken P, Barroilhet BS, Saussine C, et al. (2011) The Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study: tract dilation comparisons in 5537 patients. J Endourol 25(5): 755-762.
7. Nour HH, Kamal AM, Zayed AS, Refaat H, Badawy MH, et al. (2014) Single-step renal dilatation in percutaneous nephrolithotomy: A prospective randomised study. Arab J Urol 12(3): 219-222.
8. Srivastava A, Singh S, Dhayal IR, Rai P (2017) A prospective randomized study comparing the four tract dilation methods of percutaneous nephrolithotomy. World J Urol 35(5): 803-807.
9. Miller NL, Matlaga BR, Lingeman JE (2007) Techniques for fluoroscopic percutaneous renal access. J Urol 178(1): 15-23.
10. Tepeler A, Armagan A, Akman T, Polat EC, Ersoz C, et al. (2012) Impact of percutaneous renal access technique on outcomes of percutaneous nephrolithotomy. J Endourol 26(7): 828-833.
11. Mousavi Bahar SH, Mehrabi S, Moslemi MK (2011) Percutaneous nephrolithotomy complications in 671 consecutive patients: a single-center experience. Urol J 8(4): 271-276.
12. Amirhassani S, Mousavi Bahar SH, Iloon Kashkouli A, Torabian S (2014) Comparison of the safety and efficacy of one-shot and telescopic metal dilatation in percutaneous nephrolithotomy: a randomized controlled trial. Urolithiasis 42(3): 269-273.
13. Dehong C, Liangren L, Huawei L, Qiang W (2013) A comparison among four tract dilation methods of percutaneous nephrolithotomy: a systematic review and meta-analysis. Urolithiasis 41(6): 523-530.
14. Li Y, Yang L, Xu P, Shen P, Qian S, et al. (2013) One-shot versus gradual dilation technique for tract creation in percutaneous nephrolithotomy: a systematic review and meta-analysis. Urolithiasis 41(5): 443-448.
15. El Husseiny T, Buchholz N (2012) The role of open stone surgery. Arab J Urol 10(3): 284-288.
16. Sharma G, Sharma A (2009) Determining site of skin puncture for percutaneous renal access using fluoroscopy-guided triangulation technique. J Endourol 23(2): 193-195.
17. Labate G, Modi P, Timoney A, Cormio L, Zhang X, et al. (2011) The percutaneous nephrolithotomy global study: classification of complications. J Endourol 25(8): 1275-1280.
18. Scholes RL, Browning L, Sztendur EM, Denehy L (2009) Duration of anaesthesia, type of surgery, respiratory co-morbidity, predicted VO2max and smoking predict postoperative pulmonary complications after upper abdominal surgery: an observational study. Aust J Physiother 55(3): 191-198.
19. Akman T, Binbay M, Sari E, Yuruk E, Tepeler A, et al. (2011) Factors affecting bleeding during percutaneous nephrolithotomy: single surgeon experience. J Endourol 25(2): 327-333.
20. Cormio L, Preminger G, Saussine C, Buchholz NP, Zhang X, et al. (2013) Nephrostomy in percutaneous nephrolithotomy (PCNL): does nephrostomy tube size matter? Results from the Global PCNL Study from the Clinical Research Office Endourology Society. World J Urol 31(6): 1563-1568.
21. Astroza G, Lipkin M, Neisius A, Preminger G, De Sio M, et al. (2013) Effect of supine vs prone position on outcomes of percutaneous nephrolithotomy in staghorn calculi: results from the Clinical Research Office of the Endourology Society Study. Urology 82(6): 1240-1244.
22. Akman T, Binbay M, Kezer C, Yuruk E, Tekinarslan E, et al. (2012) Factors affecting kidney function and stone recurrence rate after percutaneous nephrolithotomy for staghorn calculi: outcomes of a long-term followup. J Urol 187(5): 1656-1661.
23. El Nahas AR, Eraky I, Shokeir AA, Shoma AM, El Assmy AM, et al. (2012) Factors affecting stone-free rate and complications of percutaneous nephrolithotomy for treatment of staghorn stone. Urology 79(6): 1236-1241.
24. Desai M, De Lisa A, Turna B, Rioja J, Walfridsson H, et al. (2011) The clinical research office of the endourological society percutaneous nephrolithotomy global study: staghorn versus nonstaghorn stones. J Endourol 25(8): 1263-1268.
25. Netto NR, Ikonomidis J, Ikari O, Claro JA (2005) Comparative study of percutaneous access for staghorn calculi. Urology 65(4): 659-662.

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